J. BOEKEL & J. H. SCHERER.

BACTERIAL INCUBATOR.

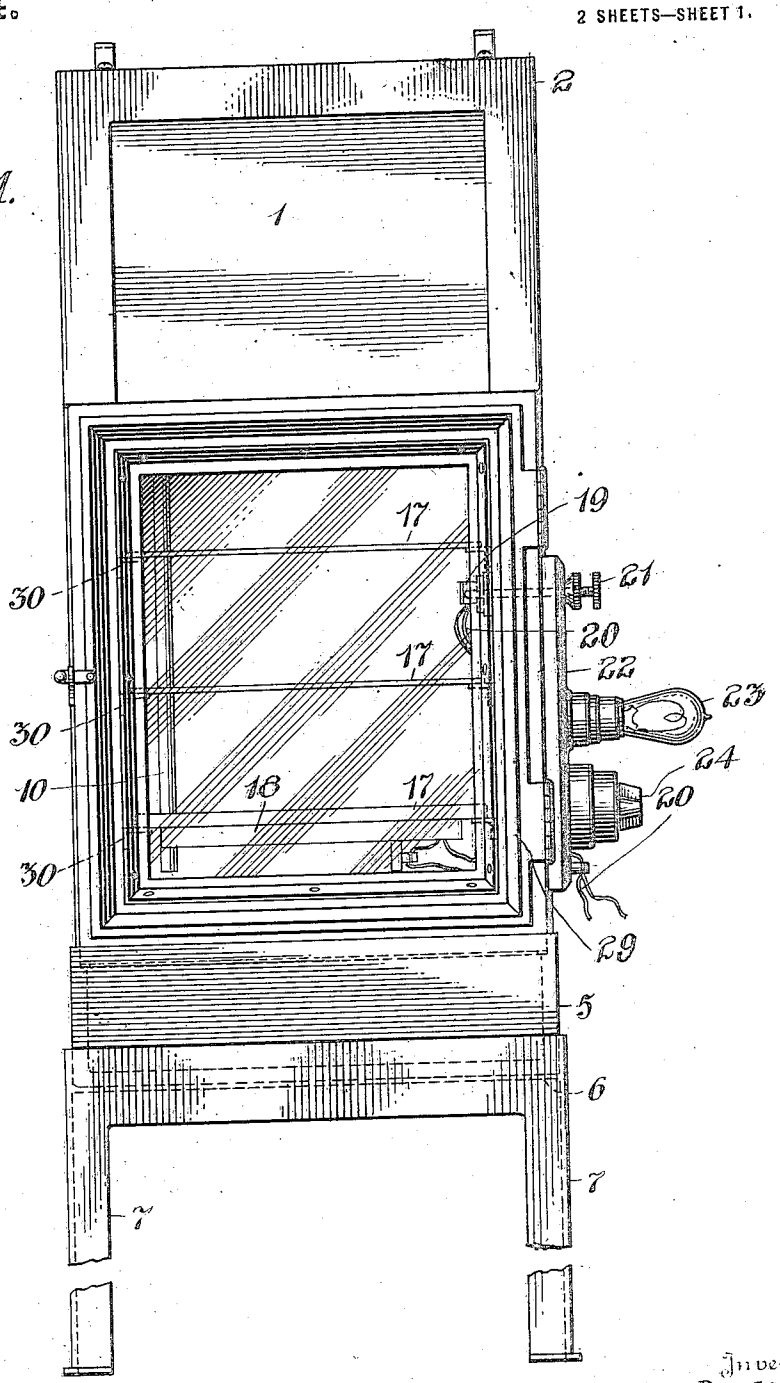
APPLICATION FILED OCT. 20, 1914.

1,145,054.

Patented July 6, 1915.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

Samuel V. Payne

G. M. Copenhaver

Inventors

Julius Boekel and

John H. Scherer.

By Wm. H. Babcock & Son

Attorney

J. BOEKEL & J. H. SCHERER.

BACTERIAL INCUBATOR.

APPLICATION FILED OCT. 20, 1914.

1,145,054.

Patented July 6, 1915.

2 SHEETS—SHEET 2.

Fig 2.

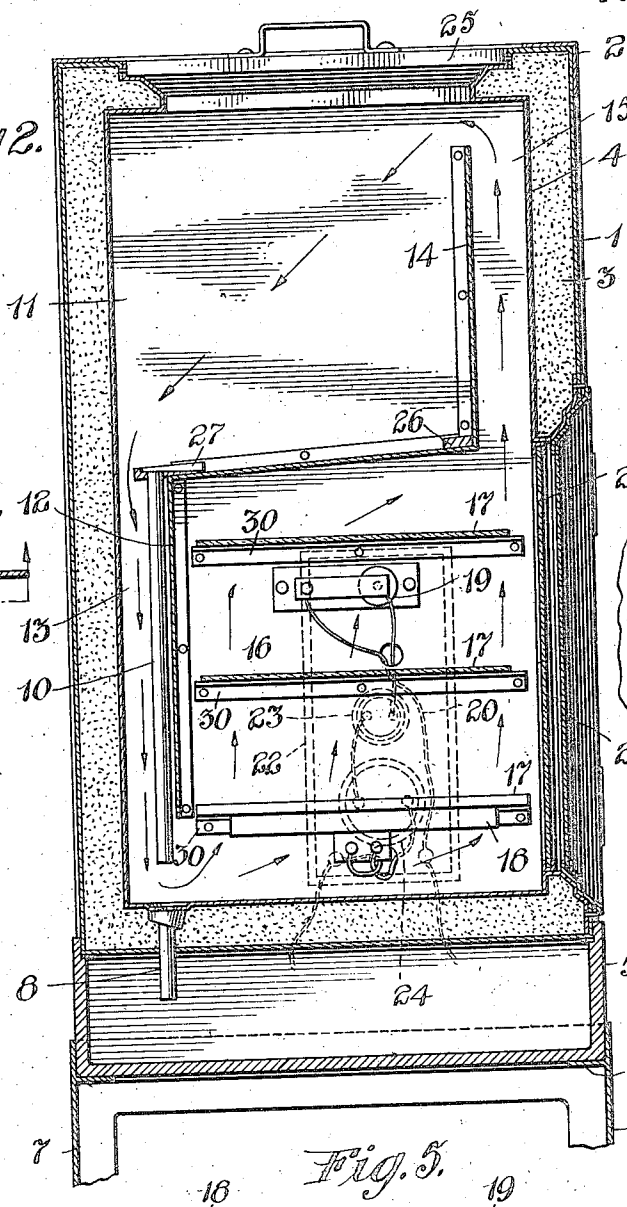


Fig. 3.

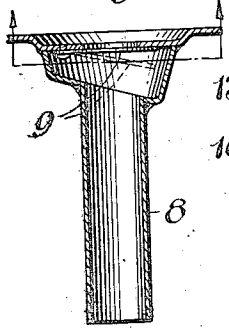


Fig. 4.

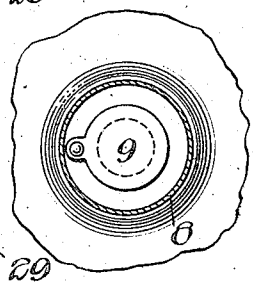
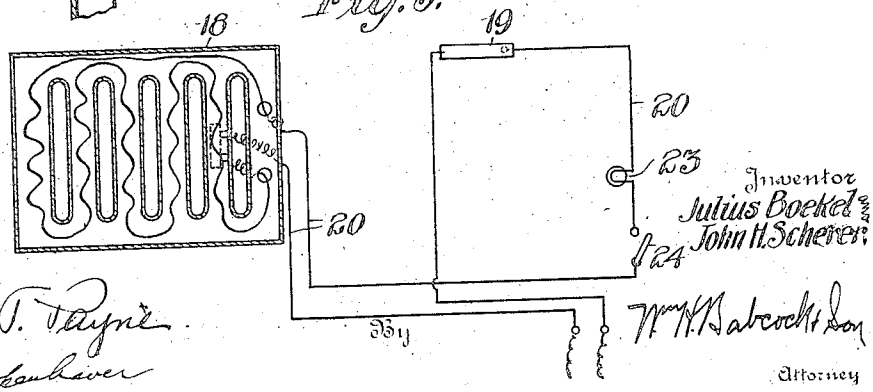


Fig. 5.



Witnesses

Samuel T. Payne.

G. M. Copenhaver

Inventor

Julius Boekel and

John H. Scherer.

By

Wm. H. Babcock & Son

Attorney

UNITED STATES PATENT OFFICE.

JULIUS BOEKEL AND JOHN H. SCHERER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO SAID BOEKEL.

BACTERIAL INCUBATOR.

1,145,054. Specification of Letters Patent. Patented July 6, 1915.

Application filed October 20, 1914. Serial No. 867,594.

To all whom it may concern:

Be it known that we, JULIUS BOEKEL and JOHN H. SCHERER, citizens of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Bacterial Incubators, of which the following is a specification.

The object of this invention is to provide certain and automatic means for maintaining the temperature needed in the incubation of bacteria and especially for preventing the temperature from rising above the degree best suited to any particular culture or species. To this end we make use of heating means for the automatic circulation of air in contact with means of refrigeration and control the same automatically by a thermostat adjusted to the proper degree and arranged in the incubating chamber, through which the current of air flows in its circuit.

The invention consists mainly in the said combination of devices, which may also be used for other purposes than propagation of bacteria.

It also consists in some ancillary and subsidiary devices and in the special construction and combination of the parts hereinafter more particularly set forth and claimed.

In the accompanying drawings: Figure 1 represents a front elevation of a bacterial incubator embodying our invention; Fig. 2, a vertical central section from front to rear of the same; Fig. 3, an enlarged detail view in vertical section of the drip tube and valve; Fig. 4, a transverse sectional view of the same looking in the direction of the arrows Fig. 2; and Fig. 5, a diagrammatic view of the circuit, showing the heater in section.

The casing 1 of the body of our incubator has an exterior wall of asbestos protected at the corners and edges by sheet metal sheathing 2 and a packing 3 of cork between the exterior asbestos wall and the sheet metal inner wall 4. This casing rests upon a stout metallic drip pan 5, which fits into the top of a supporting base 6 having legs 7. A drip pipe 8, having an outlet resilient metal flap valve 9, extends downward from the interior of said incubator body and discharges water into said drip pan, the upper end of said pipe having a flaring form containing said valve and arranged to receive the discharge of a longer drip pipe 10 extending downward from an ice box or refrigerating chamber 11 in the upper part of the interior of said incubator body. Thus the water from the melted ice and the water of condensation will escape into the drip pan at the same time. A vertical depending partition 12 extends from the bottom of said ice box down parallel and proximate to said pipe, forming a vertical passage 13 between said partition and the nearer side wall of the incubator casing. This partition ends some distance above the floor of the interior of the incubator chamber. At the opposite side of said ice box the latter is provided with a vertical raised wall 14 forming a similar passage 15 on that side and similarly stopping short of the top of the interior of said incubator body. The space next below said ice box and between said depending partition 12 and the side of the casing more remote therefrom and below passage 15 constitutes an incubating chamber 16 containing shelves 17 for supporting trays or other receptacles for bacterial cultures exposed to incubation.

Divers bacteria will not develop except at a relatively low temperature, for example, less than forty degrees: and of those kinds some require lower degrees than others, and also any appreciable variation either way from the determined temperature will injure the bacteria. It therefore becomes necessary for a steady temperature in the incubating chamber of less than will ordinarily be found in the atmospheric air and to regulate this conveniently and automatically, insuring steady and equal conditions in all parts of said incubating chamber. This is accomplished by providing a circulation of air through the ice box, down passage 13, then through the incubating chamber and up passage 15 to the ice box again. Such a current might obviously be created by supplemental mechanical devices controlled by hand; but it is obviously advisable

to dispense with such devices and make the control of the current ordinarily automatic. We therefor arrange a heating device below the incubating chamber, a thermostat within said chamber and connections which normally make circuit through said thermostat and heater and thus put said heating device into action so as to create a current through the ice box as described. Of course this heating device must not heat the incubator chamber sufficiently to counteract in any appreciable degree this cooling action. For such uses electric devices are best. We have therefore shown an electric heater 18 attached to the underside of the lowest shelf 17 of the incubating chamber and a thermostat 19 attached to the inner wall of the incubating chamber just under the upper shelf thereof.

The thermostat and heater may be of any suitable or convenient type, as we claim no novelty in their construction and the forms shown are for illustration only. It is essential however that they be capable of very delicate adjustment and of quick response to the most minute change in temperature. Electric conducting wires 20 extend from this thermostat 19, and connect the heater 18 therewith to be controlled thereby. Therefore, when the temperature in the incubating chamber rises above a predetermined point it causes the thermostat to open the circuit and thereby disconnect the heater until the incubating chamber and thermostat have so far cooled off that the latter will again close the circuit and thereby once more bring the heater into operation. The degree of temperature at which such action takes place will of course depend on the adjustment of the thermostat, which has an adjusting screw 21 extending through the side of the casing and an external switchboard or frame 22 on which an electric lamp 23 and a hand-operated switch or circuit closer 24 are also mounted, both being in said electric circuit. This lamp of course shows whether the circuit be closed or open and this switch makes it practicable to open or close the circuit by hand whenever desired.

The ice-box has an opening at the top and a removable cover 25 therefor, forming part of the incubator casing and has at the front and rear interior face of its bottom two strips 26 and 27 respectively for supporting the ice slightly clear of the bottom, thus providing an easy drain of water, the strip 27 also being formed so as to direct the water to the top of the drain. The incubator chamber is provided with hinged doors 28 and 29, forming an insulating dead air space between them, for the admission and withdrawal of cultures and receptacles. These doors form part of the front of said casing. The shelves of the latter rest preferably on brackets 30 fastened to the inner walls of the incubator casing. These details may of course be varied and other means of refrigeration may be substituted for ice, many such being well known. Of course this combination of air cooling and circulating devices operated by a heater and thermostat to cause a supply of colder air to the space about the thermostat may be used for other purposes than bacterial incubation and so may the mechanical devices and structures above described.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. An incubator casing and a refrigerating chamber and incubating chamber in said casing, a heater within said casing arranged to cause a current of air through said chambers, a thermostat in said incubating chamber and electrical connections between said thermostat and heater whereby said thermostat automatically controls the action of said heater and the temperature of the incubating chamber.

2. In combination with the hollow body of an incubator, partitions therein forming an ice-box in its upper part and an incubating chamber below said ice-box, and also leaving passages at the sides of these parts for the circulation of air through said chambers, an electric heater arranged under said incubating chamber, a thermostat arranged in the latter and connections whereby the said thermostat will open the circuit through said heater when the temperature of said incubating chamber rises above a certain degree.

3. Means for regulating temperature comprising a thermostat, electric circuit connections, a heater governed thereby, means of refrigeration and an inclosing casing provided with devices arranged to form passages for the circulation in contact with said refrigerating means and said thermostat of the air set in circulation by said heater, the said heater, refrigerating means and thermostat being in proximity to each other and operating to maintain automatically a predetermined moderate degree of temperature within said casing.

4. In combination with an incubator, ice-box and heater contained therein, which are arranged to maintain circulation of air through said ice-box and the remainder of the interior of said incubator, a thermostat in said incubator, electric connections from said thermostat to said heater and means external to said incubator for adjusting the said thermostat to regulate the degree of heat at which it will operate.

5. In combination with an incubator, an ice-box and an electric heater contained therein and arranged to maintain a circulation of air through said ice-box and the re-

mainder of the interior of said incubator, a thermostat within said incubator and connections therefrom for energizing said heater, and a hand operated switch in said circuit, which is accessible from the exterior of said incubator.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

JULIUS BOEKEL.
JOHN H. SCHERER.

Witnesses:
FREDK. MANGOLD,
ROBERT J. HAMILTON.